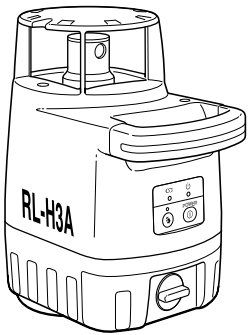
TOPCON



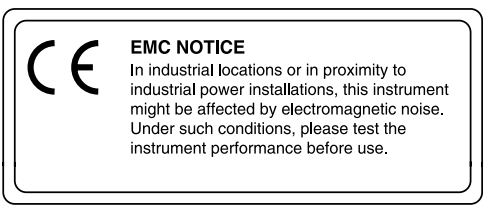
INSTRUCTION MANUAL

ROTATING LASER

RL-H3A/B

TE

Japan Surveying Instruments JSIMA Manufacturers' Association


EMC NOTICE
In industrial locations or in proximity to industrial power installations, this instrument might be affected by electromagnetic noise. Under such conditions, please test the instrument performance before use.

Foreword

Thank you for purchasing the Topcon RL-H3A/B Rotating Laser.
To quickly and effectively use the RL-H3A/B, please read these brief instructions carefully, and keep them in a convenient location for future reference.

Handling Precautions

Before starting work or operation, be sure to check that the instrument is functioning correctly with normal performance.

1 Vibration and Impact Protection

When transporting the instrument, provide protection to minimize risk of severe vibration or impact. Severe vibration or impacts may affect beam accuracy.

2 Checking battery power.

Before operating, check remaining battery life.

3 Storing the instrument for long period

Remove the batteries from the instrument when you will not be using it for long period.

Caution:

Use of adjustment controls or performance procedures other than those specified herein may results in hazardous radiation exposure.

Safety Information

In order to ensure the safe use of this product, prevent any danger to the operator or others, or damage to property, important warnings are placed on the product and inserted in the instruction manual.
We recommend that you become familiar with the meaning of these Warnings and Cautions before continuing.

Display	Meaning
⚠ **WARNING**	Ignoring or disregarding of this display may lead to death or serious injury.
⚠ **CAUTION**	Ignoring or disregarding of this display may lead to personal injury or physical damage to the instrument.

Injury refers to hurt, burn, electric shock, etc.
Physical damage refers to damage to equipment, structure or furnishings.

Safety Precautions

⚠ **WARNING**
• **There is a risk of fire,electric shock or physical harm if you attempt to disassemble or repair the instrument yourself.** This is only to be carried out by TOPCON or an authorized dealer,only!
• **Laser beams can be dangerous,and can cause eye injury if used incorrectly .** Never attempt to repair the instrument yourself.

• **High temperature may cause fire.** Do not cover the charger while it is charging.
• **Risk of fire or electric shock.** Do not use damaged power cable, plug and socket.
• **Risk of fire or electric shock.** Do not use a wet battery or charger.
• **May ignite explosively.** Never use an instrument near flammable gas, liquid matter, and do not use in a coal mine.
• **Battery can cause explosion or injury.** Do not dispose in fire or heat.
• **Risk of fire or electric shock.** Do not use any power voltage except the one given on manufacturers instructions.
• **Battery can cause outbreak of fire.** Do not use any other type of charger other than the one specified.
• **Cause eye injury or blindness.** Do not stare into beam or view directly with optical instruments.
•**The short circuit of a battery can cause a fire.** Do not short circuit battery when storing it.

⚠ CAUTION

- **Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.**
- **Do not connect or disconnect equipment with wet hands,you are at risk of electric shocks if you do!**
- **Risk of injury by overturn the carrying case.**
  Do not stand or sit on the carrying cases.
- **Please note that the tips of tripod can be hazardous,be aware of this when setting up or carrying the tripod.**
- **Risk of injury by falling down the instrument or case.**
  Do not use a carrying case with a damaged which belts,grips or latches .
- **Do not allow skin or clothing to come into contact with acid from the batteries, if this does occur then wash off with copious amounts of water and seek medical advice.**
- **Let the laser beam reach the aimed object or the target without anybody else in the laser beam path. When operating in an open area, avoid radiating laser beam at eye level. It is quite possible for the beam to enter into one's eyes, and it is possible to lose visual sight temporarily, and lose one's caution and awareness of other dangers - avoid glaring beam.**
- **It could be dangerous if the instrument falls over, please check that you fix the instrument to the tripod correctly.**
- **Risk of injury by falling down a tripod and an instrument.**
  Always check that the screws of tripod are tightened.

User Precautions

Wear the required protectors (safety shoes, helmet, etc.) when operating.

Exceptions from Responsibility

1 The user of this product is expected to follow all operating instructions and make periodic checks of the product's performance.

2 The manufacturer, or its representatives, assumes no responsibility for results of a faulty or intentional usage or misuse including any direct, indirect, consequential damage, and loss of profits.

3 The manufacturer, or its representatives, assumes no responsibility for consequential damage, and loss of profits by any disaster, (an earthquake, storms, floods etc.), fire, accident, or an act of a third party and/or a usage in other than usual conditions.

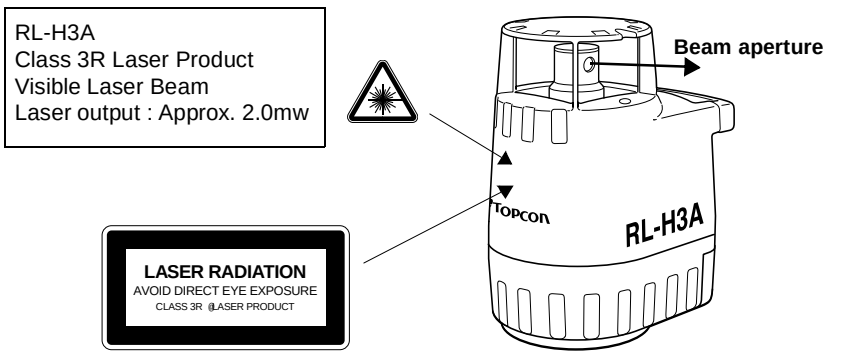
4 The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits due to a change of data, loss of data, an interruption of business etc., caused by using the product or an unusable product.

5 The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits caused by usage other than explained in the user manual.

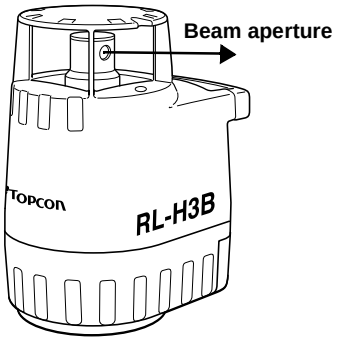
6 The manufacturer, or its representatives, assumes no responsibility for damage caused by wrong movement, or action due to connecting with other products.

Laser Safety

This product uses a visible laser beam, and is manufactured and sold in accordance with “Performance Standards for Light-Emitting Products” (FDA/BRH 21 CFR 1040) or “Radiation Safety of Laser Products, Equipment Classification, Requirements and User’s Guide” (IEC Publication 60825-1) provided on the safety standards for laser products.
As per the said standard, RL-H3A standard model is classified as “Class 3R Laser Product” and RL-H3B model is classified as “Class 1 Laser Products”. In case of any failure, do not disassemble the instrument. Contact TOPCON or your TOPCON dealer.



RL-H3B
Class 1 Laser Product
Visible Laser Beam
Laser output : Approx. 0.9mw



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Standard System Components

RL-H3A

1)RL-H3A Instrument 1set
2)Battery unit * 1set
3)LS-70A/B Laser Sensor ** ..... 1pc.
4)Laser Sensor holder model 6 .... 1pc.
5)Carrying case ..... 1pc.
6)Instruction manual ..... 1vol.

*Depending on which power configuaration was purchased, battery components are below.

**The model of laser sensor included is dependent on your purchasing option.

Dry battery type

Battery holder DB-57 ..... 1pc.
Dry batteries (R20P type) ..... 4pcs.

Rechargeable battery type

Battery holder DB-57C ..... 1pc.
Ni-MH battery pack BT-49Q ..... 1pc.
AC/DC converter AD-9B/7C ..... 1pc.

RL-H3B

1)RL-H3B Instrument 1set
2)Battery unit * 1set
3)LS-70A/B Laser Sensor ** ..... 1pc.
4)Laser Sensor holder model 6 .... 1pc.
5)Carrying case ..... 1pc.
6)Instruction manual ..... 1vol.

*Depending on which power configuaration was purchased, battery components are below.

**The model of laser sensor included is dependent on your purchasing option.

Dry battery type

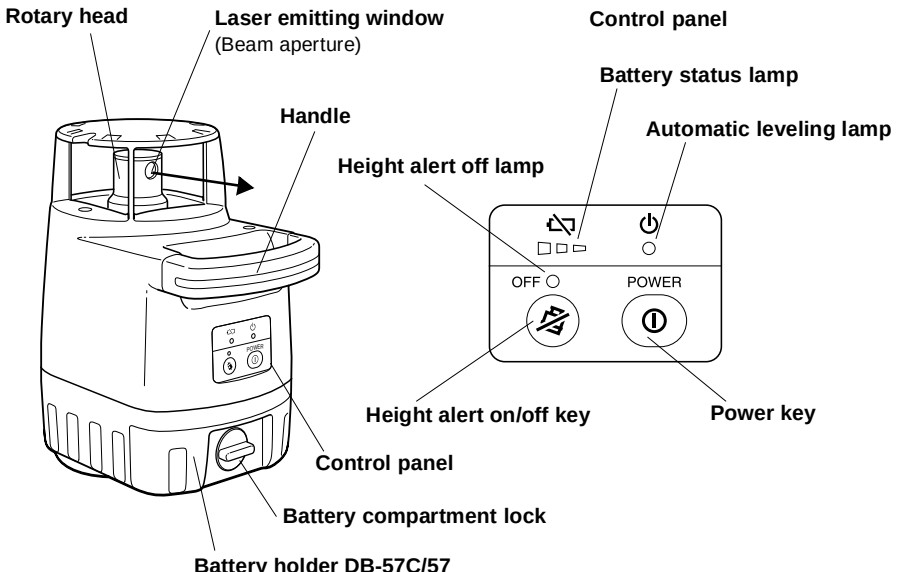
Battery holder DB-57 ..... 1pc.
Dry batteries (R20P type) ..... 4pcs.

Rechargeable battery type

Battery holder DB-57C ..... 1pc.
Ni-MH battery pack BT-49Q ..... 1pc.
AC/DC converter AD-9B/7C ..... 1pc.

•Please make sure that all of above items are in the box when you unpack.

Nomenclature



Preparation for Use

Power Source

Connect the battery according to the type of battery purchased.
For handling batteries, see the "Handling Power Sources" chapter.

Setting Instrument Up

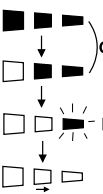
Set the instrument on a tripod or smooth surface.

Power Key

Turn the instrument ON or OFF by pressing the power key.
Automatic leveling will start by turning the power switch ON.

Battery Status Display

Battery status will be displayed for several minutes when the instrument is powered on or when the battery level changes.



Continuous Battery is sufficient. (Stays lit for about one minute)

Blinking The power is low, but laser is still usable. (Blinking continues until batteries are dead.)

Blinking order Dead batteries. Recharge the battery or replace the dry batteries with new ones.(The laser will turn completely off after blinking for about five minutes.)
NOTE:Even if an AC/DC converter is connected at this time, blinking still continues. Once the power is turned off, the battery status display will reset.

Note: LS-70A/B Laser Sensor can detect low power state of laser.

Auto-leveling Lamp

Blinking : Leveling automatically. When automatic leveling is almost complete, blinking will slow. The rotary head is rotating slowly, and the laser beam is emitting.

On solid : Completes leveling. The rotary head is rotating (600rpm) and emits a laser beam horizontally.

Intermittent Blinking

: The instrument is inclined beyond the automatic leveling range. The rotary head is not rotating, nor the laser beam emitting.**Turn off and level the instrument again, then turn on the instrument again.**

Note:If auto-leveling is not completed after two or three minutes, turn on the instrument again after relevelling the tripod or surface.

Height Alert Function

If the instrument is disturbed for some reason after automatic leveling is complete, the height alert function is activated. The auto-leveling lamp and height alert off lamp will blink at the same time and the LS-70A/B laser sensor will display a warning. Turn the power key OFF and ON again, the auto-leveling function will start again.You should also recheck the elevation of the laser beam to confirm it has not changed.

Note:

1) LS-70A/B Laser Sensor can detect the height alert warning.

2)To change ON/OFF of the height alert function

Press the height alert on/off key twice continuously when the height alert function is active, the function will become inactive and the height alert off lamp will turn on.

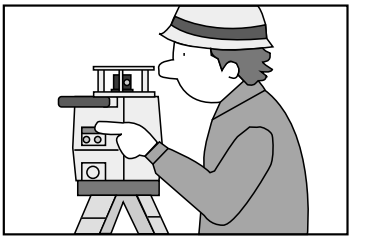
If you press the height alert on/off key once again, the function will become active again.

The initial mode of the function in power ON is active.

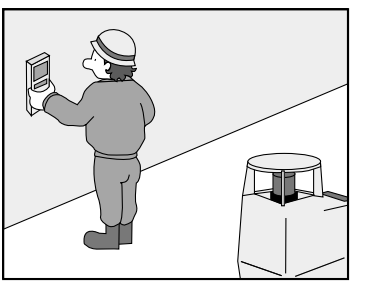
How to Operate

1 Set the instrument on a tripod or smooth surface and power ON.

2 Turn on LS-70A/B laser sensor.
To change the on-grade precision of the laser sensor, press the on-grade precision mode button. (page 27)

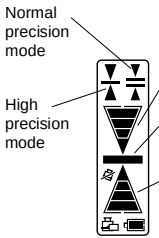


3 Place the laser sensor in the path of rotating laser beam.



For more information about Topcon laser sensors, see pages 26 and 27 in this manual.

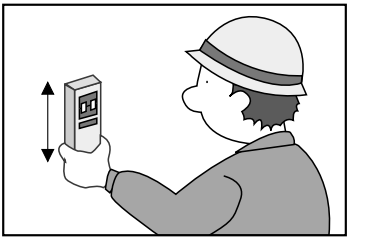
4 Move the laser sensor up or down until the LCDÅ@ and audible indicators identifies the center of the laser beam has beam located..



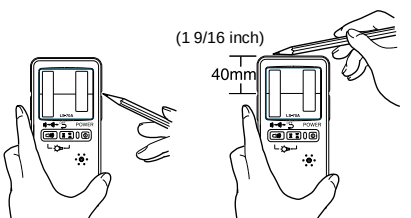
Higher than datum position
(Buzzer sound:High frequent beep sound)
Move the sensor downward.

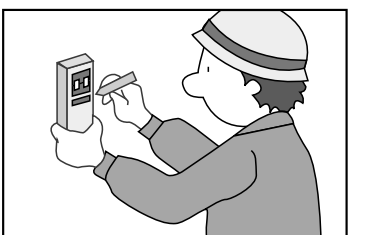
Datum position
(Buzzer sound:Continuous beep sound)

Lower than datum position
(Buzzer sound:Low frequent beep sound)
Move the sensor upward.

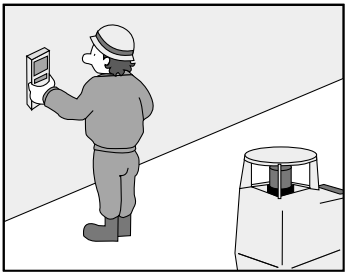


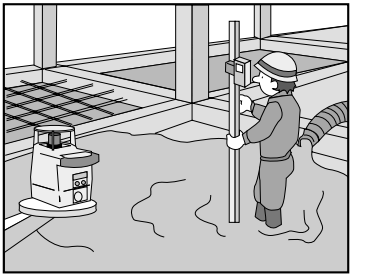
5 Mark the position of index. The center-of-beam index is 40 mm (1 9/16 inch) from the top of the sensor if you wish to mark the top of the sensor and use an offset.





Operational Example



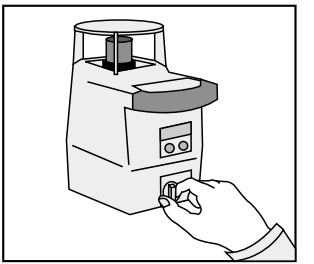


Maintaining Power Sources

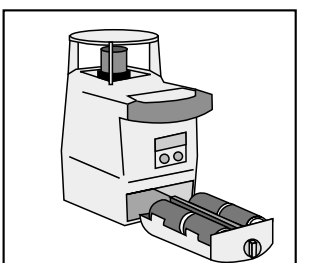
Dry Battery

Replacing Dry Batteries

1 Remove the battery cover by turning the battery cover knob to “OPEN”.



2 As illustrated, remove the old batteries and replace them with new dry batteries in direction of ⊕ ⊖ .



3 Replace the battery cover and turn the knob to “LOCK”.

Note :
Replace all 4 batteries with new ones.
Do not mix old batteries and new ones.

Rechargeable Battery

Installing

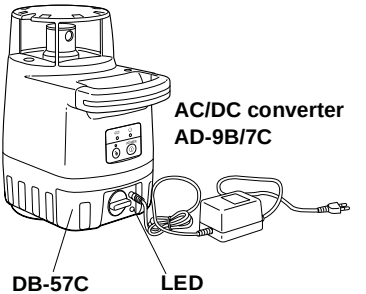
1 Insert Ni-MH BT-49Q battery pack into the DB-57C battery holder.

2 Insert the battery pack into the instrument and turn the battery compartment lock to “LOCK”.

Charging

1 Plug the AC/DC converter (AD-9B or AD-7C) into the DB-57C battery holder.

2 Plug the converter power cord into an outlet. (AD-9B is for AC120V, AD-7C is for AC230V)



3 Complete charging by unplugging the converter connector from the DB-57C battery holder after approximately 9 hours.

4 Unplug the converter power cord.

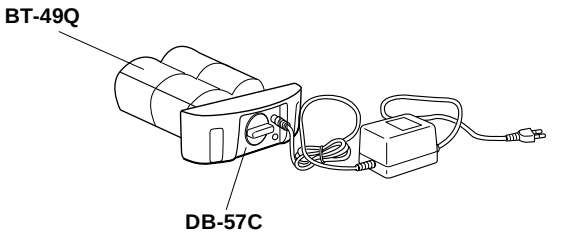
The LED of DB-57C will indicate charging status:

Red ON : Charging.
Green ON : Charging completed.
Green flashing : BT-49Q battery pack is not installed correctly.
Red flashing : BT-49Q battery pack protection feature is working automatically.
RL-H3A/B can be used in this state.

Automatic protection feature: In case of overcharge or high or low temperature state exceeding charging range, charging will be stopped or changed to protect battery.

Note :

1) The BT-49Q rechargeable battery can be charged while using the laser.
2) The BT-49Q rechargeable battery can be charged when removed from the instrument.
3) When the BT-49Q rechargeable battery cells are removed from the DB-57C battery holder, the instrument can be used with alkaline batteries installed in the battery pack.



Note :

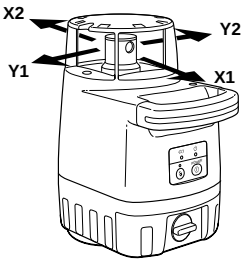
1) Recharging should take place in a room with an ambient temperature range of 0°C to 40°C (32°F to 104°F).
2) The battery source will discharge when stored and should be checked before using with instrument.
3) Be sure to charge stored battery source every 3 or 4 months and store in a place at 30° (86°F) or below. If you allow the battery to become completely discharged, it will have an effect on future charging.

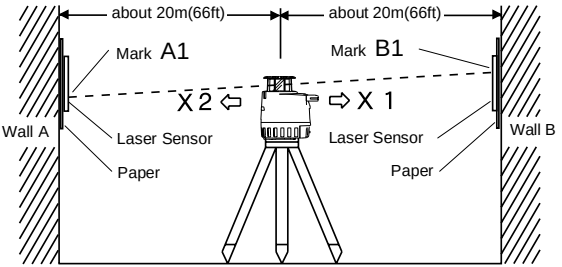
Note : This battery does not contain mercury.

Checking and Adjusting

Horizontal Calibration

Checking





1 Set up the tripod at a midpoint between two walls, A and B. Ideally, the walls should be 40 meters (130 feet) apart. Take care when setting up the tripod to make sure the tripod head as level as possible and that it is securely positioned.

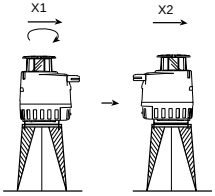
2 Mount the instrument to the tripod so side X2 is facing wall A, and X1 is facing wall B (see illustration above).Turn power on and allow the instrument to auto-level.

3 Turn on the LS-70 laser sensor and set it to fine precision (see page 27).

4 Attach a piece of paper to each wall so it is approximately centered in the path of the rotating laser beam. Using the LS-70, locate the exact position of the laser on wall A and mark the position on the paper. Call this mark A1. Repeat this procedure on wall B. Call this mark B1.

5 Turn the instrument off, loosen the tripod mount and rotate the instrument 180 degrees. Side X1 should now be facing wall A and X2 facing wall B.

Note:
Do not to disturb the position of the tripod while rotating the instrument.

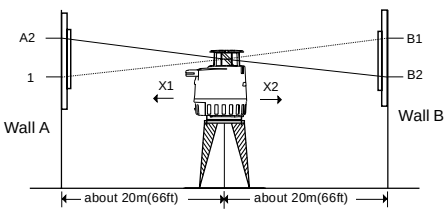


6 Turn power back on to the instrument and allow it to auto-level.

7 Using the LS-70, locate the excat position of the laser on wall A and mark the position on the paper. Call this mark A2. Repeat this procedure on wall B. Call this mark B2. Measure the distance between marks A1 and A2. Measure the distance between marks B1 and B2. Add the two distances together. If the total distance is less than that indicated below for your model, no adjust-ment is necessary for the X axis.

RL-H3A: ±3mm or .12 inches
(approximately 1/8 inch)
RL-H3B: ±4mm or .16 inches
(slightly less than 3/16 inch)

Note:
If total distance exceeds 40mm (1.6 inches), contact your Topcon dealer.



8 If no adjustment is needed in the X axis, repeat this procedure for the Y-axis using sides Y1 and Y2.

Adjusting

After checking calibration as described in the previous, follow this procedure if adjustment is required. Be sure not to move the tripod or paper used while checking calibration.

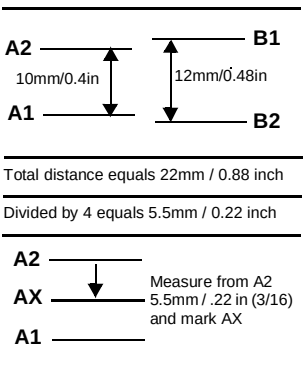
1 Make a calibration reference mark (AX) on wall A as follows:

a. Measure the distance between marks A1 and A2.
Measure the distance between marks B1 and B2.
Add the two distances together. (this is same distance as determined in step 7)

b. Divide the total by four (4).

c. Starting at mark A2, measure toward mark A1 the distance calculated in step b above and make a new mark AX.

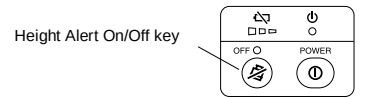
EXAMPLE:
A1 to A2 is 10mm (0.4 inch)
B1 to B2 is 12mm (0.48 inch)
Total of both distances is 22mm (0.88 inch)
Divided by 4 equals 5.5mm (0.22 or 3/16 inch)
Mark AX is made 5.5mm (3/16 inch) below A2



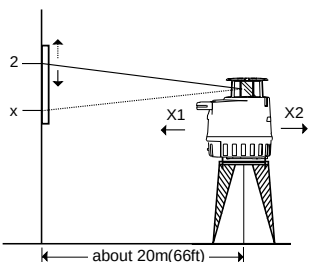
2 Turn the instrument off.

3 While pressing the height alert on/off key, press the power key. Then press the height alert on/off key again within two seconds to enter adjustment mode. The height alert lamp and battery status lamps will flash.

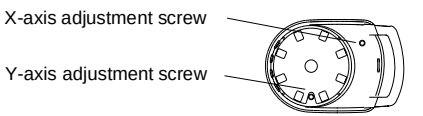
Note:
Do not disturb the instrument or tripod while performing step 3.



4 Using the hex wrench supplied with the instrument, adjust the axis adjustment screw (see illustration at right) until the beam is center on the new mark AX. Use the X axis screw when adjusting the X-axis calibration and the Y-axis screw when adjusting the Y axis calibration.



Instrument as seen from above



Note:
The laser beam is moved up or down approximately 6mm (.25 inch) at a distance of 20m (66 feet) by turning the screw one complete revolution.

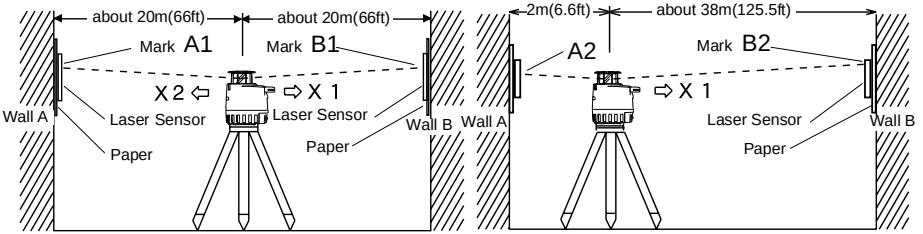
5 Turn the instrument off.

6 Repeat the checking procedure in the previous section to confirm proper calibration has been obtained.

7 If Y axis adjustment was required, repeat this procedure for the y axis.

Horizontal Rotation Error of Cone

Perform the following check after completing "Horizontal Calibration" on the previous page.



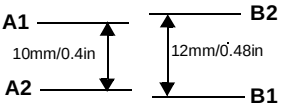
1 Set up instrument on tripod between two walls as was done to check calibration (see page 19). Repeat steps 1 to 4 of Horizontal Calibration Checking procedure to make two marks A1 and B1 on the paper on each wall. (The instrument can be set up in either X or Y direction.)

2 Turn off the instrument and move it so it is no more than 2m (6.5 ft) from wall A. Do not change orientation of the instrument and try to maintain same elevation. Turn power on again and allow to auto-level.

3 Make two new marks, A2 and B2, on the paper on each wall.

4 Measure the distance between each set of marks. If the difference between the measurements is less than 4mm (0.16 inch or approximately 5/32 inch), cone error adjustment is not required.

EXAMPLE:
A1 – A2 = 10mm
B2 – B1 = 12mm
12mm – 10mm = 2mm



2mm is less than 4mm so cone error adjustment is not required.

Note:
If difference exceeds 4mm (0.16 inch), contact your Topcon dealer.

Storage Precautions

Always clean the instrument after use.
Use a clean cloth, moistened with a neutral detergent or water. Never use an abrasive cleaner, ether, thinner benzene, or other solvents.

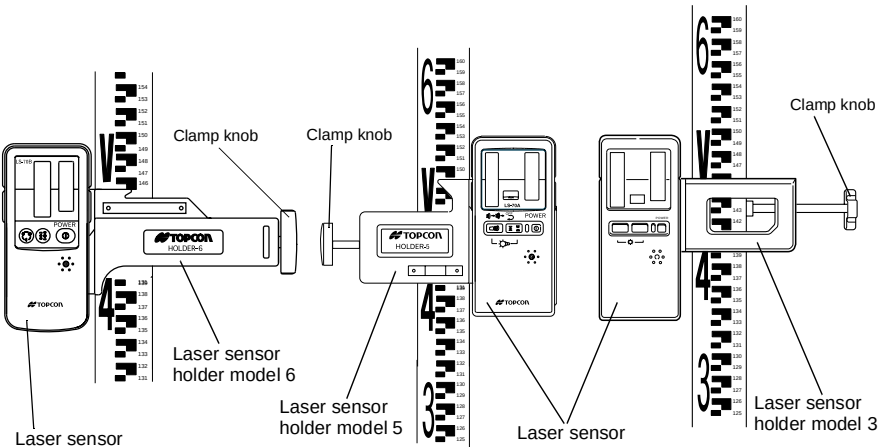
Always make sure instrument is completely dry before storing. Dry any moisture with a soft, clean cloth.

Standard / Optional Accessories

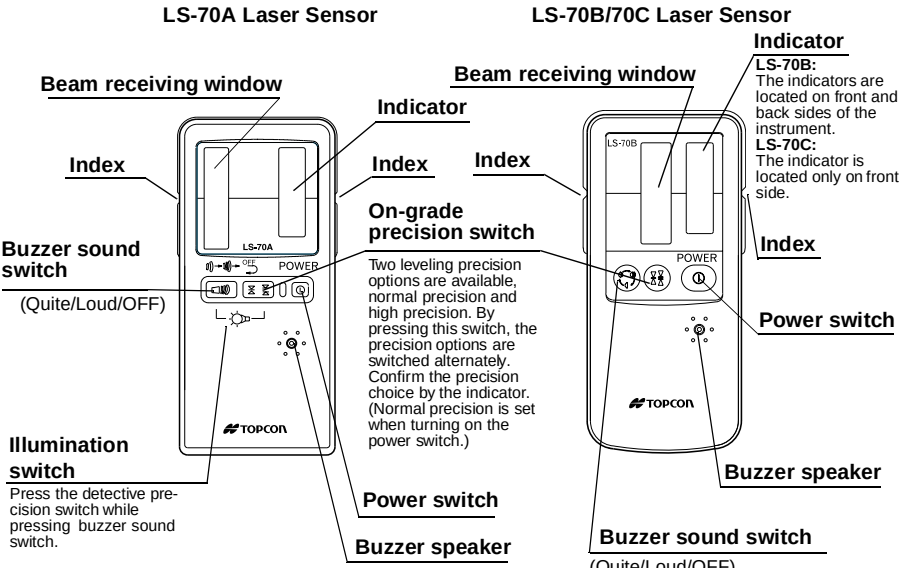
Laser sensor holder model 6

Laser sensor holder model 5

Laser sensor holder model 3



Holder model 5 allows sensor to move on the rod by squeezing a clamp located in the back side without the need to loosen the clamp knob.



Auto-cut off function

The power will be turned off automatically if no laser beam is detected within approximately 30 minutes. (To turn the sensor on again, press the power switch.)

Display (LS-70A/70B)

High precision mode

Normal precision mode

Height alert warning of rotating laser *1

A flash and a buzzer sound signifies that the height alert function of rotating laser is operating.
Laser sensor can detect the signal of height alert warning of the rotating laser.

The buzzer will sound for about five seconds.
The height alert warning will flash until the sensor detects normal laser from the rotating laser or the power of the sensor is turned off.

Rotating laser battery warning *2

A flash shows that the rotating laser power is low.
The laser sensor can detect the laser battery warning.

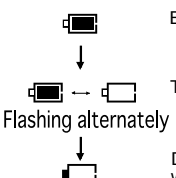
Higher than datum position
(Buzzer sound:High frequent beep sound)
Move the sensor downward.

Datum position
(Buzzer sound:Continuous beep sound)

Lower than datum position
(Buzzer sound:Low frequent beep sound)
Move the sensor upward.

Battery remaining display
Indicates the battery remaining of LS-70A/70B as follows.

Note:
The warning displays *1 and *2 are the alarm signals that the laser sensor detects from the rotating laser.
This function can be disabled by pressing the buzzer sound switch while you turn on power to the LS-70 sensor.



Battery is sufficient.

The power is low, but sensor still operates.

Dead battery. Replace the dry battery with new one.

Detective Range (LS-70A/70B)

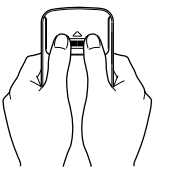
	HIGH	NORMAL
	LS-70A ±1mm/±.0032ft (2mm/.0064ft width) LS-70B ±1mm/±.0032ft (2mm/.0064ft width)	±2mm/±.0064mm (4mm/.013 ft width)
	±5mm/±.016ft (10mm/.032ft width)	
	±10mm/±.033ft (20mm/.066ft width)	
	±15mm/±.05ft (30mm/.10ft width)	
	More than ±15mm/±.05ft	
	Laser sensor has been moved above or below the laser beam. Move sensor in direction of arrow to receive laser.	

Replacing Battery (LS-70A/70B)

1 Press the lid in the direction of the arrow to lift.

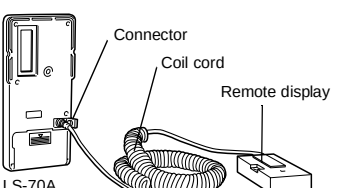
2 Take out the battery and place a new one into the battery box.

3 Press the lid down and click to close.



Remote Display with Coil Cord (LS-70A option only)

It is possible to view the LCD display of the laser sensor up to approximately 5m(16ft) from the laser sensor by using the optional remote display with the coil cord.



Specifications

Accuracy		
RL-H3A	:	±1.9mm(0.074in)/50m(164ft) (±8") (±8 arc seconds)
RL-H3B	:	±2.4mm(0.094in)/50m(164ft) (±10") (±10 arc seconds)
Auto-leveling range	:	±3°
Measuring range (Diameter)		
RL-H3A	:	Approx.2~700m(6.5~2300ft) (with LS-70A/B)
RL-H3B	:	Approx.2~400m(6.5~1300ft) (with LS-70A/B)
Rotation speeds	:	600 (rpm)
Light source	:	L.D (Visible laser)
Battery remaining warning	:	LED flashing
Power supply	:	4D-CELL alkaline batteries (DC6V)
	:	Ni-MH battery pack BT-49Q with run/charge feature
Continuous operating time		
		With disposable alkaline batteries
RL-H3A	:	Approx.120 hours
RL-H3B	:	Approx.120 hours
		With rechargeable Ni-MH battery pack BT-49Q
RL-H3A	:	Approx.60 hours
RL-H3B	:	Approx.60 hours
Tripod screw	:	Flat and dome head type, 5"/8X11threads
Protection against water and dust	:	IP56(Based on the standard IEC60529)
Operating temperature	:	-20°C ~ +50°C (-4°F ~ +122°F)
Dimensions	:	220(L)X144(W)x241(H) mm [8.6(L)x 5.6(W)x9.4(H) in]
Weight	:	2.6 kg (5.7 lbs) (with alkaline batteries installed)
	:	2.8 kg (6.1 lbs) (with rechargeable battery pack BT-49Q installed)

LS-70A/B Laser Sensor

Detective range	:	50mm (2.0 in)
Detective precision	:	High precision:±1mm(±0.04 in) Normal precision:±2mm(±0.08 in)
Detective beam indication	:	Liquid crystal and buzzer
Power source	:	DC 9V dry battery
Auto shut-off delay	:	Approx. 30 minutes without beam detection.
Operating temperature	:	-20°C to +50°C (-4°F to +122°F)
Continuous operating time at +20°C (68°F)		
Alkaline manganese dry batteries	:	Approx. 80 hours

Dimensions

LS-70A	:	167(l) × 78(w) × 27(h) mm [6.6(L) × 3.1 (W) × 1.1(H) in]
LS-70B	:	165(l) × 78(w) × 26(h) mm [6.5(L) × 3.1 (W) × 1.0(H) in]
Weight	:	0.25 kg [0.55 lbs] (with dry batteries)
Remote display connector	:	Optional for LS-70A only

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